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ADOPTION OF ARTIFICIAL INTELLIGENCE IN CURRICULUM DESIGN AND DEVELOPMENT FOR SECONDARY SCHOOLS IN AKWA IBOM STATE

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ABSTRACT

This study examined the adoption of Artificial Intelligence (AI) in curriculum design and development for secondary schools in Akwa Ibom State. In carrying out this study, descriptive survey design was adopted. The study was conducted in Akwa Ibom State. The target population comprised all principals and professionals in Educational Management and Planning in Akwa Ibom State. A stratified sampling technique was used to select 40 professionals from Educational Management and Planning, as well as 20 principals from each of the three senatorial districts (Uyo, Eket, and Ikot Ekpene) in Akwa Ibom State. This gave a total of 180 respondents, which formed the sample size for this study. The instrument used for data collection was a structured questionnaire titled "Artificial Intelligence in Curriculum Design and Development Questionnaire (AICDDQ)." Face and content validation of the instrument were carried out by an expert in Test, Measurement, and Evaluation as well as Educational Management and Planning to ensure its accuracy, appropriateness, and completeness for the study. The reliability coefficient obtained was 0.85, which was considered sufficiently high to justify the use of the instrument. Descriptive statistics were used to answer the research questions. From the result of the data analysis, it concluded that strategic implementation and continuous evaluation of AI technologies are essential for improving the quality of secondary education and preparing students for the demands of a rapidly evolving digital world. One of the recommendations was that government and school authorities should invest in ICT infrastructure, including reliable internet access, computers, and AI-powered educational tools, to support effective AI driven- curriculum design and development.

KEYWORDS: Artificial Intelligence, Curriculum Design, Development, Secondary School, Akwa Ibom State

INTRODUCTION

The rapid advancement of technology has significantly transformed various sectors of society, including education, where innovative tools are continuously reshaping teaching and learning processes. One of the most impactful technological developments in recent times is Artificial Intelligence (AI), which has the potential to revolutionize curriculum design and development. AI enables the creation of adaptive, personalized, and data-driven learning experiences that cater to the diverse needs of students. In the context of secondary education, curriculum design is a critical factor that determines the quality of knowledge delivery and students' preparedness for future challenges. Therefore, integrating AI into curriculum

development has become an important step toward enhancing educational effectiveness and relevance (Holmes et al., 2019; Luckin et al., 2016). However, the adoption of AI in curriculum design offers numerous opportunities for improving instructional planning, content delivery, and student assessment. AI-powered systems can analyze students' learning patterns, identify gaps in understanding, and recommend appropriate learning materials, thereby promoting individualized learning. In addition, AI can assist curriculum developers in creating dynamic and flexible content that aligns with global educational standards and emerging workforce demands. Despite these benefits, the integration of AI into secondary school curricula in many developing regions, including Akwa Ibom State, remains limited due to challenges such as inadequate infrastructure, lack of technical expertise, and insufficient policy support (UNESCO, 2021).

In Akwa Ibom State, the need to adopt AI in curriculum design and development is becoming increasingly important as the education system strives to meet the demands of a digital age. Secondary schools play a crucial role in preparing students for higher education and the workforce, making it essential to incorporate innovative approaches that enhance learning outcomes. Assessing the adoption of AI in curriculum development will help identify existing gaps, opportunities, and strategies for effective implementation. This study, therefore, seeks to examine how AI can be integrated into curriculum design in secondary schools within the state, with the aim of improving teaching effectiveness, student engagement, and overall educational quality.

Statement of the problem

Despite the recognized potential of artificial intelligence (AI) to transform curriculum design and development, its integration into secondary school education in Akwa Ibom State remains largely underdeveloped and inconsistent as the current curriculum practices still depend heavily on traditional, rigid structures that do not adequately respond to students' diverse learning needs or the demands of a rapidly evolving digital society . Although AI has the capacity to support personalized learning, continuous assessment, and data-driven decision-making, many schools in the state face significant barriers such as inadequate ICT infrastructure, limited technical expertise among educators, and insufficient policy support for implementation. In addition, concerns relating to data quality, ethical issues, and resistance to change further hinder the effective adoption of AI in curriculum processes. As a result, the existing curriculum may not fully equip students with essential 21st-century skills needed for academic success and global competitiveness. Therefore, the problem lies in the gap between the potential benefits of AI in curriculum development and its actual application in secondary schools in Akwa Ibom State, creating a need for systematic investigation into how these challenges can be addressed for effective integration.

Research Objective

1. To examine the roles of Artificial Intelligence (AI) in curriculum design and development for secondary schools in Akwa Ibom State.
2. To determine the challenges of using AI in curriculum design and development for secondary schools in Akwa Ibom State.
3. To identify mitigating strategies to the challenges of adopting AI in curriculum design and development for secondary schools in Akwa Ibom State.

Research question

1. What are the roles of Artificial Intelligence (AI) in curriculum design and development for secondary schools in Akwa Ibom State?
2. What are the challenges of using AI in curriculum design and development for secondary schools in Akwa Ibom State?
3. What are the mitigating strategies to the challenges of adopting AI in curriculum design and development for secondary schools in Akwa Ibom State?

LITERATURE REVIEW

Concept of Artificial Intelligence

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think, learn, and make decisions. It involves systems capable of performing tasks such as reasoning, problem-solving, perception, and language understanding. According Kingsley & James (2025) AI enables machines to perform tasks that require human intelligence, such as speech recognition, decision-making, and data analysis. Modern AI relies heavily on data and algorithms to improve performance over time and adapt to complex environments. AI has become a data-driven field focused on building intelligent systems for real-world applications (Zhang et al., 2021).

A major component of AI is machine learning, which allows computers to learn from data without explicit programming. These systems analyze patterns and use them to make predictions or decisions. According to Habeeb, Adesemowo & Babatunde (2025) With the help of AI, the companies can create some aspect of complex language translation and pattern recognition by disparate independent algorithms in an effort to implement some business globally. A more advanced subset, deep learning, uses neural networks to process complex data such as images and speech. This approach has significantly improved AI performance, especially in areas like healthcare and image recognition (Esteva. 2021).

AI can be classified into narrow AI and general AI based on capability. Narrow AI is designed for specific tasks such as virtual assistants, recommendation systems, and chatbots, and is widely used today. General AI, however, refers to machines that could perform any intellectual task a human can do, though it remains theoretical. Current research highlights that most progress is still within narrow AI systems (Dwivedi. 2021).

The application of AI spans many industries, making it a transformative technology. In healthcare, AI assists in diagnosis and treatment planning; in finance, it is used for fraud detection and risk analysis; and in transportation, it supports autonomous systems. AI is also widely used in natural language processing and computer vision, enabling machines to understand language and interpret images (Topol, 2020).

Despite its benefits, AI raises several ethical and societal concerns, including data privacy, algorithmic bias, and job displacement. There is a growing need for ethical frameworks to guide AI development and ensure fairness, accountability, and transparency. Addressing these challenges is essential for the responsible use of AI technologies in society (Jobin, Ienca, & Vayena, 2021).

Concept of Curriculum design and Development

Curriculum development encompasses the planning, execution, and assessment procedures of the curriculum, which are guided by curriculum models. Curriculum design is primarily concerned with matters like what should be included in the curriculum and how to present it so that the curriculum can be implemented with comprehension and success. According to Idris (2024), curriculum design is the process of selecting a subject and developing a teaching strategy for it. This entails choosing the materials to be utilized, arranging them, and figuring out how to apply them in the classroom to help the students' knowledge and skills grow.

Mohanasundaram (2018) defined curriculum design as the ways in which the curriculum components are positioned. As explained by Adauches (2025), curriculum design has to do with creating a plan that educators can utilize and implement within their classroom, with teachers relying on the curriculum design to develop lesson plans and identify activities that their students will relate to. Curriculum development encompasses the planning, execution, and assessment procedures of the curriculum, which are guided by curriculum models. Curriculum design is primarily concerned with matters like what should be included in the curriculum and how to present it so that the curriculum can be implemented with comprehension and success.

According to Idris (2024), curriculum design is the process of selecting a subject and developing a teaching strategy for it. This entails choosing the materials to be utilized, arranging them, and figuring out how to apply them in the classroom to help the students' knowledge and skills grow. Mohanasundaram (2018) defined curriculum design as the ways in which the curriculum components are positioned. As explained by Adauches (2025), curriculum design has to do with creating a plan that educators can utilize and implement within their classroom, with teachers relying on the curriculum design to develop lesson plans and identify activities that their students will relate to.

On the other hand, curriculum development is a planned, a purposeful, progressive, and systematic process to create positive improvements in the educational system (Mohanasundaram, 2018). It is the process of setting up and establishing specific guidelines of instruction for the curriculum. According to Kranthi (2017), curriculum development has a broad scope because it is not only about the school, the learners, and the teachers. It also has to do with the evolution of society as a whole. One of the most important aspects of education is the curriculum development process, which has a very broad reach and involves practically everyone involved in the teaching and learning process. Its objective is to create, prepare, investigate, and develop the course materials and content as well as instructional strategies in order to attain the intended results.

Roles of AI in Curriculum and Development

Curriculum development is becoming more effective, individualized, and data-driven thanks to artificial intelligence (AI), which is revolutionizing education. AI assists teachers in developing curricula that are pertinent, flexible, and in line with students' skills by establishing an adaptable learning environment, forecasting skill requirements, and providing ongoing assessment and feedback. Its incorporation guarantees that educational opportunities are interesting, inclusive, and ready to meet the needs of the contemporary workforce.

- **Curriculum Design and Planning**

AI can find holes in the current curriculum by analyzing large databases on industry requirements, learning outcomes, and student performance. AI assists teachers in identifying areas where pupils could struggle and emphasizing subjects that require greater attention by utilizing predictive analytics. This guarantees that courses are both sensitive to changing knowledge demands and in line with current educational standards. AI, for instance, can recommend incorporating cutting-edge technology or multidisciplinary subjects that help students get ready for their future employment.

- **Personalized Learning Paths**

AI systems are excellent at evaluating big datasets to comprehend the learning preferences, styles, and advancement of students. AI may use this data to generate customized learning experiences that meet the individual needs of every student. According to Evanick (2025), this personalization ensures learners receive appropriately challenging content, keeping them engaged and fostering a deeper understanding of the material.

- **Creation of Adaptive Learning Environment**

AI systems to evaluate student performance information and create individualized learning programs based on each student's requirements and skills. By continually monitoring students' learning behaviors and outcomes, AI systems can offer real-time adjustments to instructional materials, ensuring that each learner receives optimal support (Deora et al., 2024). This customization makes studying more interesting and successful by assisting students in overcoming obstacles and achieving their academic objectives.

- **Continuous Assessment and Feedback**

AI-powered tools provide real-time feedback on students' performance. This allows teachers to quickly identify strengths and weaknesses and adjust the curriculum accordingly to improve learning outcomes. Moreover, continuous assessment helps track students' progress over time and supports personalized interventions. This ensures that learning gaps are addressed promptly and effectively (Sapawi & Yusoff, 2025).

- **Curriculum Content Improvement**

AI helps update curriculum content regularly by integrating current knowledge, technological advancements, and global trends. This ensures that what students learn remains relevant in a rapidly changing world. Additionally, AI can recommend the inclusion of emerging topics such as digital literacy and artificial intelligence itself. This keeps the curriculum modern and aligned with societal needs (Mosly, 2024).

- **Predictive Analysis**

AI can predict students' performance and identify those at risk of failure. This enables early intervention and helps educators modify curriculum plans to support such learners effectively. It also assists institutions in planning support programs and improving retention rates. Predictive analytics therefore enhances both academic success and institutional effectiveness (Chu & Ashraf, 2025).

- **Support for Inclusive Education**

AI promotes inclusivity by adapting learning materials for students with different abilities, including those with disabilities. It ensures equal learning opportunities for all students. Furthermore, AI tools such as speech recognition and text-to-speech technologies support learners with special needs. This creates a more equitable and accessible learning environment (Sapawi & Yusoff, 2025).

- **Enhancement of Teaching Methods**

AI supports innovative teaching strategies such as virtual simulations, intelligent tutoring systems, and interactive learning platforms. These methods make learning more engaging and practical. In addition, AI enables experiential learning by simulating real-life situations that enhance understanding. This improves both teaching effectiveness and student participation (Ejjami, 2024).

- **Skill-Based Curriculum Development**

AI helps identify important 21st-century skills such as critical thinking, creativity, and digital literacy. It supports the integration of these skills into curriculum design to prepare students for future careers. Moreover, AI ensures that curricula remain aligned with labor market demands and technological changes. This prepares learners to be competitive in a global economy (Mosly, 2024).

- **Continuous Curriculum Evaluation**

AI allows continuous monitoring and improvement of the curriculum through data analysis and feedback from learners and educators. This could be curriculum project or any other project outside academic. According to Adeyemi & Amhana (2024) a monitoring plan specifies when and how the status of the project will be evaluated. This ensures that the curriculum remains effective and up to date. Additionally, AI supports evidence-based revisions, making it easier to adapt curriculum to changing educational needs. Continuous evaluation helps maintain high standards in education and promotes long-term improvement (Chu & Ashraf, 2025).

Challenges of AI in Curriculum design and Development

Curriculum design and development are increasingly using artificial intelligence (AI), which offers chances for efficiency, customization, and data-driven decision-making. Nevertheless, despite these benefits, a number of important obstacles prevent its successful application in educational institutions.

- **Data quality and bias**

A significant obstacle is the problem of bias and data quality. Large datasets are a major component of AI systems' recommendations for curriculum organization and content. The resulting curriculum may perpetuate current disparities or omit particular viewpoints if these

datasets are biased, out-of-date, or incomplete. For instance, Holmes et al. (2021) emphasize that biased training data can lead to unequal learning experiences, particularly for marginalized groups.

- **Lack of contextual and pedagogical understanding**

Lack of pedagogical and contextual knowledge is another serious issue. The cultural, social, and emotional components of learning—which are crucial for curriculum development—are frequently difficult for AI systems to integrate. According to Zawacki-Richter et al. (2020), AI lacks the human judgment necessary to align curriculum with local educational needs, values, and learning environments, making it difficult to fully replace human educators in curriculum planning.

- **Ethical and privacy issues**

Privacy and ethical concerns are also significant challenges. Concerns regarding data security and student privacy are raised by the regular collection and analysis of student data involved in the use of AI in curriculum design. Williamson and Eynon (2020) argue that without proper regulation, AI systems may misuse sensitive information, leading to ethical dilemmas and reduced trust among stakeholders.

- **Technical infrastructure and accessibility**

There is also the issue of accessibility and technical infrastructure. Many educational institutions, especially those in developing nations, lack the infrastructure required to support AI-driven curriculum development, such as dependable internet connectivity and sophisticated computer systems. As noted by Bond et al. (2021), this digital divide can widen educational inequalities rather than reduce them.

- **Resistance to change among educators and institutions**

Educators' and institutions' opposition to change is another barrier. Teachers may be hesitant to use AI tools because they lack technical know-how or fear losing their jobs. According to Luckin et al. (2022), successful integration of AI requires continuous professional development and a shift in mindset, which can be difficult to achieve in traditional educational systems.

- **Cost implementation and maintenance**

Lastly, a major obstacle is still the cost of implementation and upkeep. AI systems can be costly to develop, implement, and maintain, which restricts their use in environments with limited resources. Schools are frequently unable to fully utilize AI's potential in curriculum development due to this budgetary obstacle.

Mitigating Strategies to the Challenges of Adopting AI in Curriculum design and Development

It takes a combination of technological, ethical, pedagogical, and policy-oriented approaches to mitigate the difficulties of implementing Artificial Intelligence (AI) in curriculum design and development. To fully utilize AI's potential while reducing dangers to privacy, equity, and quality in education, these issues must be resolved.

- **Ensure data quality and minimize bias**

Minimizing bias and ensuring data quality are important tactics. Large datasets are essential to AI systems, and inadequate or biased data can result in unfair or ineffectual curriculum. Institutions should put in place strict procedures for data inspection and validation to guarantee that datasets are representative and updated often. As Holmes et al. (2021) emphasize, continuous monitoring of AI outputs and algorithmic transparency can reduce the risk of biased recommendations in educational contexts.

- **Integrating human oversight and pedagogical expertise**

Another essential strategy is to combine instructional knowledge with human oversight. AI should support educators in developing curricula, not take their place. AI systems can be guided by educators and curriculum experts to match information with pedagogical principles, cultural norms, and local circumstances. Zawacki-Richter et al. (2020) argue that hybrid models combining AI analytics with human judgment provide more adaptable and context-sensitive curricula.

- **Ethical and privacy concerns**

Institutions need to implement strong data governance policies in order to handle ethical and privacy issues. This entails gaining informed consent, anonymizing student data, and adhering to national privacy laws and regulatory requirements like the GDPR. Williamson and Eynon (2020) highlight that embedding ethical AI frameworks into education reduces risks of data misuse and fosters trust among students and stakeholders.

- **Enhancing infrastructure and accessibility**

To close the digital divide, infrastructure and accessibility must be improved. AI-driven curriculum creation can be made inclusive by investing in dependable internet connectivity, cloud-based platforms, and reasonably priced computer devices. Bond et al. (2021) suggest that collaborative platforms and open-source AI tools can support institutions with limited resources.

- **Professional development and capacity building**

Adoption difficulties are also lessened by professional development and capacity building for educators. Effective incorporation into curriculum design is ensured by teaching educators how to effectively use AI technologies, evaluate analytics, and make wise judgments. Luckin et al. (2022) emphasize that ongoing professional learning programs promote positive attitudes toward AI and reduce resistance to change.

- **Cost management strategies**

Lastly, AI adoption may be made more sustainable through cost-management techniques including phased implementation, open-source AI solutions, and collaborations with technology suppliers. Schools and higher education institutions can pilot AI applications in

limited domains before scaling, which allows assessment of effectiveness and cost-efficiency (Holmes et al., 2021).

Methodology

In carrying out this study, descriptive survey design was adopted. The study was conducted in Akwa Ibom State. The target population comprised all principals and professionals in Educational Management and Planning in Akwa Ibom State. A stratified sampling technique was used to select 40 personnel from Educational Management and Planning, as well as 20 principals from each of the three senatorial districts (Uyo, Eket, and Ikot Ekpene) in Akwa Ibom State. This gave a total of 180 respondents, which formed the sample size for this study. The instrument used for data collection was a structured questionnaire titled *"Artificial Intelligence in Curriculum Design and Development Questionnaire (AICDDQ)."* Face and content validation of the instrument were carried out by an expert in Test, Measurement, and Evaluation to ensure its accuracy, appropriateness, and completeness for the study. The reliability coefficient obtained was 0.85, which was considered sufficiently high to justify the use of the instrument. Descriptive statistics were used to answer the research questions.

RESULTS AND DISCUSSIONS

Research Questions 1:

The research question sought to examine the roles of Artificial Intelligence (AI) in curriculum design and development for secondary schools in Akwa Ibom State. To answer the research question percentage analysis was performed on the data, (see table 1).

Table 1:

Percentage Analysis of the roles of Artificial Intelligence (AI) in curriculum design and development for secondary schools in Akwa Ibom State

Roles of AI in curriculum design	Frequency	Percentage
Curriculum Design and Planning	33	18.33**
Personalized Learning Paths	15	8.33
Creation of Adaptive Learning Environment	10	5.56*
Continuous Assessment and Feedback	11	6.11
Curriculum Content Improvement	20	11.11
Predictive Analysis	18	10.00
Support for Inclusive Education	18	10.00
Enhancement of Teaching Methods	12	6.67
Skill-Based Curriculum Development	22	12.22
Continuous Curriculum Evaluation	21	11.67
TOTAL	**180**	**100%**

** **The highest percentage frequency**

* **The least percentage frequency**

SOURCE: Field survey

The above Table 1 presents the percentage analysis of the roles of Artificial Intelligence (AI) in curriculum design and development for secondary schools in Akwa Ibom State. From the result of the data analysis, it was observed that the highest percentage (18.33%) was recorded against "Curriculum Design and Planning", while the least percentage (5.56%) was recorded against "Creation of Adaptive Learning Environment". This finding agrees with the opinion of Mosly, (2024) who mentioned that AI helps identify important 21st-century skills such as critical thinking, creativity, and digital literacy. It supports the integration of these skills into curriculum design to prepare students for future careers. Moreover, AI ensures that curricula remain aligned with labor market demands and technological changes. This prepares learners to be competitive in a global economy. This result also support the findings of with Ejjami, (2024) who stated that AI supports innovative teaching strategies such as virtual simulations, intelligent tutoring systems, and interactive learning platforms. These methods make learning more engaging and practical.

Research Questions 2:

The research question sought to determine the challenges of using AI in curriculum design and development for secondary schools in Akwa Ibom State. To answer the research question percentage analysis was performed on the data, (see table 2).

TABLE 2:
Percentage Analysis of the challenges of using AI in curriculum design and development for secondary schools in Akwa Ibom State

Challenges	Frequency	Percentage
Data quality and bias	38	21.11**
Lack of contextual and pedagogical understanding	35	19.44
Ethical and privacy issues	31	17.22
Technical infrastructure and accessibility	26	14.44
Resistance to change among educators and institutions	29	16.11
Cost implementation and maintenance	21	11.67*
TOTAL	**180**	**100%**

** **The highest percentage frequency**
* **The least percentage frequency**
SOURCE: Field survey

The above Table 2 presents the percentage analysis of the challenges of using AI in curriculum design and development for secondary schools in Akwa Ibom State. From the result of the data analysis, it was observed that the highest percentage (21.11%) was recorded against "Data quality and bias". While the least percentage (11.67%) was recorded against "Cost implementation and maintenance". This finding agrees with the Zawacki-Richter et al. (2020), who mentioned that AI lacks the human judgment necessary to align curriculum with local educational needs, values, and learning environments, making it difficult to fully replace human educators in curriculum planning. However his opinion also align with that Williamson and Eynon (2020 who also noted that) argue that without proper regulation, AI systems may

misuse sensitive information, leading to ethical dilemmas and reduced trust among stake holders.

Research Questions 3:

The research question sought to identify mitigating strategies to the challenges of adopting AI in curriculum design and development for secondary schools in Akwa Ibom State. To answer the research question percentage analysis was performed on the data, (see table 3).

TABLE 3:
Percentage Analysis of the mitigating strategies to the challenges of adopting AI in curriculum design and development for secondary schools in Akwa Ibom State

Mitigating strategies	Frequency	Percentage
Ensure data quality and minimize bias	39	21.67**
Integrating human oversight and pedagogical expertise	37	20.56
Ethical and privacy concerns	32	17.78
Enhancing infrastructure and accessibility	30	16.67
Professional development and capacity building	23	12.78
Cost management strategies	19	10.56*
TOTAL	**180**	**100%**

** **The highest percentage frequency**
* **The least percentage frequency**
SOURCE: Field survey

The above Table 3 presents the percentage analysis of the mitigating strategies to the challenges of adopting AI in curriculum design and development for secondary schools in Akwa Ibom State. From the result of the data analysis, it was observed that the highest percentage (21.67%) was recorded against "The ability to ensure data quality and minimize bias", while the least percentage (10.56%) was recorded against "cost management strategies". This finding agrees with the opinion of Williamson and Eynon (2020) who noted Institutions need to implement strong data governance policies in order to handle ethical and privacy issues. This entails gaining informed consent, anonymizing student data, and adhering to national privacy laws and regulatory requirements like the GDPR. His opinion also aligns with that of Luckin et al. (2022), who observe that emphasize that ongoing professional learning programs promote positive attitudes toward AI and reduce resistance to change.

CONCLUSION

In conclusion, the adoption of Artificial Intelligence in curriculum design and development presents a significant opportunity to transform secondary education in Akwa Ibom State. By enabling personalized learning, improving instructional planning, and supporting data-driven decision-making, AI can enhance both teaching effectiveness and student academic performance. However, successful implementation depends on the availability of adequate infrastructure, skilled personnel, and supportive educational policies. Addressing these challenges through strategic investment, capacity building, and continuous evaluation will ensure that AI integration is both effective and sustainable. Ultimately, embracing AI in

curriculum development will not only improve the quality of education but also equip students with the skills needed to thrive in an increasingly digital and technology-driven world.

RECOMMENDATIONS

- The Akwa Ibom State Ministry of Education should develop clear policies and guidelines for integrating Artificial Intelligence into curriculum design and development at the secondary school level.
- Government and school authorities should invest in ICT infrastructure, including reliable internet access, computers, and AI-powered educational tools, to support effective implementation.
- Teachers should be provided with continuous training and professional development programmes to equip them with the necessary skills to use AI tools in curriculum planning and instructional delivery.

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